

Persons responsible for the formulation and direction of national policy are constantly confronted with problems of predicting the future under unknown or unanticipated social and psychological conditions. Basic issues in the processes of negotiation behavior involve such questions as: If a particular course of action is adopted, how will the environment respond? Given the social pressures and human prejudices that are operative, what is feasible? Would some other course of action be more productive for the nation as a whole or for some particular interest groups? Here the authors present a simulation vehicle and supporting experiments to study problems of national policy planning and negotiation.

## A SIMULATION VEHICLE FOR STUDYING NATIONAL POLICY FORMATION IN A LESS ARMED WORLD<sup>1</sup>

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EFFORTS to predict in the real world are frequently confounded by the presence of unknown or unanticipated social and psychological variables. Yet those responsible for the formulation and direction of national policy are constantly confronted with the problem of predicting the future under precisely such conditions. If a particular course of action is adopted, how will the environment respond? Given the social pressures and human prejudices which are operative, what is feasible? What are the possible unanticipated consequences of alternative courses of action? These and similar questions face every decision maker. They involve basic issues about the processes of negotiation behavior engaged in by representatives of significant interests within a country—and the mechanisms involved in national policy formation.

One area involving such complex interactions, and one which has engaged a great deal of public attention, is the long-range impact of disarmament on the American econ-

omy. Despite the fact that the "economic" impacts have possibly decisive political and social overtones, the problem has until now been treated almost exclusively from an economic point of view. One recent book in this area (Benoit & Boulding, 1963) concluded that the economic problems of disarmament can be solved. But the approach to this problem, which they advocate as the "only reasonably satisfactory fiscal solution," calls for nondefense spending to offset declines in defense spending. Some examples of the kinds of nondefense programs they suggest are the following:

Ending serious poverty	\$6.8-8.8 billion/ annum
Industrial plant and equipment	16.3
Health	7.8
Education	11.6
Housing	4.5
Urban water, sewage, & solid waste	4.5
Urban transportation	1.0
Water resource development	7.9
Natural resources	1.6
Research and development	1.4
Foreign assistance	2.0
	<hr/> \$65.4-67.4 billion

<sup>1</sup> We wish to acknowledge the efforts of Robert Theobald, who helped in the preparation of our socio-economic model. Many of the specific relationships needed for construction of the model were unavailable in the form required, and we are grateful to him for helping to define the parameters and set initial values for them. This article was prepared while all three authors were at the System Development Corporation, Falls Church, Virginia.

But would it be possible, even under conditions of crisis, to convince the various strategic interest groups in our society that

passage of legislation to improve education or health or urban transportation, for example, is really more in the interest of society than reducing the public debt? What elements in the society might cooperate to promote or defeat such a program of balanced offsets? Would increased communication among diverse interest groups help to solve the problem? Would the pressure generated by rising unemployment help different interests to arrive at compromise solutions?

There are several ways of answering such questions. One approach, developed in this paper, is to assemble representatives of these groups and simulate the conditions they would face in the event of a less armed world. The vehicle described here represents an effort to study certain domestic, social, economic, and political problems through the use of simulation.<sup>2</sup>

These problems have to do with the impact of disarmament on American society. We have not focused on a single aspect such as the economy; instead our society is treated as a complex system of social, economic, and political variables. The basis for such an approach was summarized more than a decade ago by Robin M. Williams, Jr. (1960), when he said: "Repeatedly in different aspects of American political institutions and political behavior a common pattern emerges: the

balancing of interests and compromising of conflicts through multiple power-centers, numerous separate channels of influence, and the subdivision of political authorities."

Some implications of the approach used in the present study become clear when we look at basic assumptions. It is assumed that diverse interest groups will have more than a passing interest in the type of disarmament treaty that is negotiated, in the nature of force reductions, and in the programs advocated for spending (or saving) defense monies. It is assumed that these interest groups will interact in some fashion to promote specific proposals and to block others. It is assumed that some proposals will emerge as acceptable and others will die—some will affect the economy and others will not. Finally, it is assumed that our society is a complex and dynamic organism. If it is to be understood, and if the decisions that affect its destiny are to be made in the most informed manner, it must be treated as a system.

An overview of a simulation method devised to study some of the problems of a less armed world is presented here. In addition, two pilot studies, designed to explore the possibilities of the method and to develop experimental hypotheses for more definitive testing, are also described.

### SIMULATION VEHICLE

The simulation vehicle consisted of a socioeconomic model of the American society, a simulation of major interest groups within that society, and a set of exercise procedures enabling the simulated interest groups to make decisions on given public policy issues during specific future time periods. A metasystem, consisting of observers, simulators, and data recorders, controlled the conduct of the exercises. Each interest group sought to make its decisions in ways and at times best calculated to achieve a set of defined objectives. These decisions were periodically submitted to the metasystem where the consequences were calculated and the results fed back to participants, who then made new decisions in an effort to reach their objectives.

Exercises were divided into cycles, each

<sup>2</sup> Several different kinds of simulation can be distinguished. When used to study real-life problems, simulation involves the construction of models and the movement of these models through time. Sometimes the model is an actual physical representation of the real-world system (physical simulation). Sometimes it is a mathematical or logical representation of the real-life system (symbolic simulation). And sometimes the models are used in an attempt to simulate the operational environment to which humans respond (environmental simulation). Frequently, the latter type of problem requires the use of all three kinds of simulation simultaneously. The application of elaborate simulation vehicles in the social sciences is relatively new. Studies have reported attempts to apply complex simulation methods to such diverse areas as international affairs (Guetzkow, 1959), arms control (Davis, 1963), and voter behavior (De Sola Pool & Abelson, 1961; Orcutt, Greenberger, Korbel, & Rivlin, 1961). There are also a number of general introductions to the problem (Biel, 1962; Boguslaw & Porter, 1962; Davis & Behan, 1962; Davis, Carpenter, & Missler, 1962; and Guetzkow, 1962).

of which represented six months of real time, but required approximately one hour of simulation time to complete.

### Strategic interest groups

Although any number of different interest groups could have been identified, six strategic groups were utilized: Business, Labor, Civil Rights, Military, Internationalists, and Nationalists. A single subject played the role of each interest group and was encouraged to see himself as representing a broad set of interests defined by the goals and literature of his group. He was urged not to play the role of a specific organization or a leader. Orientation to the role was provided by a combination of means. Interest group goals were specified for participants by the experimenters (Table 1).

As an additional means of role definition and orientation, each subject was provided with a packet of materials containing policy statements, convention resolutions, constitutions and bylaws, in-house literature, and external propaganda of *real* organizations whose views could reasonably be said to fit into the generic categories of "Business," "Military," "Labor," etc. After these materials had been read, the experimenters discussed each participant's interpretation of his own interest group's objectives in order to insure complete understanding of his role. The following are examples of the materials provided for each interest group:

#### NATIONALISTS

*The White Book of the John Birch Society* (1962);  
American Legion Resolutions on Disarmament and the UN, 45th Annual Convention, 1963;  
Resolutions of the 72nd Continental Congress of the DAR (1963);  
*VFW Key Objectives for 1964*.

#### INTERNATIONALISTS

*1963-1964 Statement of Legislative Policy* issued by Friends Committee on National Legislation;  
*Statement of Policy of the American Association for the UN, Third Biennial Convention* (1962);  
*A Program for Americans* by Americans for Democratic Action;  
SANE Policy Statements: 1963;  
1962-1963 Report of the Council of Churches on International Affairs;  
United World Federalist Pamphlet;  
Women Strike for Peace Pamphlet.

TABLE 1  
INTEREST GROUP GOALS

Interest Groups	Goals	
	Increase	Decrease
Business	Gross national product Productivity Profit before taxes Expenditures for new plant and equipment	Total U.S. federal budget Unemployment rate
Civil Rights		Ratio of nonwhite to white unemployed Ratio of white to non-white per capita income Ratio of nonwhite to white living in sub-standard housing units Ratio of nonwhite to white high school dropouts Unemployment rate
Internationalists	Total United Nations budget U.S. budget for foreign aid	U.S. national defense budget Unemployment rate
Labor	Gross national product Average weekly earnings (industrial workers) Productivity U.S. nonmilitary budget	Unemployment rate High school dropout rate
Military	Gross national product U.S. national defense budget Military personnel and civilian employees of defense department U.S. military strength compared to the U.S.S.R.	
Nationalists	U.S. national defense budget U.S. military strength compared to the U.S.S.R. Military personnel and civilian employees of defense department	Total U.S. federal budget U.S. budget for foreign aid Total United Nations budget

#### BUSINESS

*1963-1964 Policy Declarations of the Chamber of Commerce of the United States*;  
National Association of Manufacturers, *Industry Believes: Policies of Current Problems as Adopted by the Board* (1962);  
*Farm Policies for 1964*, Resolutions Adopted at the 45th Annual Meeting of the American Farm Bureau Federation (1963).

**LABOR**

Proceedings and Resolutions of the Fifth Annual Convention of the AFL-CIO (1963);  
 Sample issues of AFL-CIO News;  
*Labor Looks at Congress 1963: AFL-CIO Legislative Report*;  
 Sample issues of the Teamster Magazine and Newsletter;  
 Program of the IUE-Full Citizenship in World Affairs Conference, held in Washington, February 23-26, 1964, by the International Union of Electrical and Radio Workers.

**MILITARY**

Sample issues of *Air Force and Space Digest*, published by the Air Force Association;  
 Sample issues of *Navy Magazine of Seapower*, published by the Navy League;  
 Sample issues of *Army*, published by the Association of the U. S. Army;  
 Resolutions adopted at the 1963 Meeting of the Air Force Association;  
 U. S. Department of Defense, Statement of Secretary of Defense Robert S. McNamara before the House Armed Services Committee on the fiscal year 1965-1966 Defense Program and 1965 Defense Budget (January 27, 1964).

**CIVIL RIGHTS**

*The March to Freedom*, 1962 Report of the NAACP;  
 "Federal Action for Civil Rights," Reprint from *Current*, December 1961, distributed by the NAACP;  
 Leadership Conference on Civil Rights, *Federal Support Discrimination: A Survey of its Extent, A Program of Executive Action to Eliminate It*, 1961;  
 Leadership Conference on Civil Rights, Memorandum Concerning the Administration's Civil Rights Bill of 1963.

**Environmental description**

Prior to the exercise, each participant was given a written Description of the Exercise Environment, which described the national and international context of the study. Exercises began on 1 January 1965 and lasted for five years (exercise time). A Description of the Exercise Environment briefly described the overall political situation and included a discussion of such items as the status of the Cold War, disarmament negotiations, comparative military strengths, the U.S. budgets for defense, foreign aid, space, the United Nations, etc.

As for the national picture, the Description of the Exercise Environment contained a discussion of civil rights and unemploy-

ment problems, and presented figures for the Gross National Product, total federal budget, high school dropout rate, dwellers in substandard housing, etc. Trends of economic and social indicators were summarized.

**Public policies**

The principal activity of interest groups centered around the consideration of a set of public policy issues. Participants negotiated with respect to these policies and allocated resources for or against them. Policy issues included the following:

- Individual tax exemptions should be raised from \$600 to \$800 per year.
- The maximum corporate income tax rate should be reduced from 48 % to 40 %.
- The federal government should undertake public works and related measures totalling \$5 billion.
- The work week should be reduced from 40 hours to 35 hours without any reduction in wages.
- Federal aid to education should be increased by \$3.0 billion (100 %).
- A National Fair Employment Practices Commission should be empowered to eliminate discrimination in employment.
- The federal government should be empowered to provide aid to schools in areas where substandard education to minority groups is found to exist.
- The federal government should spend \$11 billion to eliminate extreme poverty through direct subsidies to the poor.
- The federal government, at a cost of \$8 billion, should institute a program to provide facilities for adequate medical care and medical payments for low-income families.
- The U. S. should negotiate with the Soviets an agreement for complete disarmament.
- The U. S. should abrogate its agreement with the U.S.S.R. for complete disarmament.
- The U. S. should enlarge its present civil defense program by \$500 million per year.

- At a cost of \$2 billion per year, the U. S. should expand its production of long-range supersonic bombers (B-70's) in order to maintain a capability for manned bomber attacks.
- The U. S. should spend an additional \$2 billion per year to intensify its non-military campaign against communism.
- The U. S. should withdraw from the United Nations.
- The U. S. should increase existing foreign aid levels by 50 %.
- The U. S. should increase its spending on space programs by \$2 billion per year.

In addition to a listing of the policies, participants were given background statements elaborating each policy. For example, a policy entitled "Individual tax exemptions should be raised from \$600 to \$800 per year," was described as follows:

There is increasing agreement among economists, especially those with a labor orientation, that additional income to individuals will increase the demand for goods. This, in turn, will result in an increased Gross National Product which should help reduce unemployment, increase profits, etc. The tax cut of 1964 was based on precisely this rationale.

It is now proposed that a further tax cut should take place which would raise individual exemptions from \$600 to \$800 per year. This policy, if enacted, presumably would have the effect of providing additional disposable income to those at the lower end of the income scale. It should lead to large increases in the demand for consumer goods and increase the size of the Gross National Product.

### The decision-making process

Exercise participants were required to make a series of decisions at the close of each game cycle. To aid the decision-making process and control and conduct of an exercise, participants consulted and used a number of forms. The use of these forms was explained to them prior to the start of the exercise in an Instruction Sheet which outlined the procedures they were to follow. The forms included: a Resource Allocation form, a Record of Resource Allocation, a Semi-annual Statistical Summary sheet, and a Message form.

After evaluating the situation at the beginning of each six-month period, the par-

ticipants had to decide which policies to support or oppose, and to allocate resources accordingly. Whenever they felt it necessary, they were free to negotiate with each other. At the start of the exercise, each participant had available 100 resource units. These units did not represent money, votes, or activities of interest group members; they were a quantitative representation of the total influence each group could exert in society on behalf of its interests. Participants allocated their resource units for or against any or all of 15 policies, subject to the restriction that no more than 50 units per year could be used to oppose policies. The actual allocation was accomplished by placing plus or minus amounts, e.g., +25 or -10, in the space provided next to each policy on the Resource Allocation form. In January of each simulated year, participants received 100 new resource units which could be used either at the end of the first six months or at the end of the year. The entire 100 units, however, had to be used each year and could not be accumulated from one year to the next.

For the purposes of the pilot studies described in this paper, the algebraic sum of 200 units was required for policy adoption, although none of the participants was told this. This number is clearly a variable controlling the ease or difficulty of policy acceptance.

A Message form was used for communication among participants. Except at formally arranged conferences, participants were not permitted to speak directly to the experimenters or other participants. When they wished to arrange a conference with other interest groups, request a conference room, or ask questions, they did so by means of a Message form.

To help participants keep track of their decisions, they were asked to record their allocations on a Record of Resource Allocation sheet which they retained throughout the exercise. To help them make intelligent decisions and be aware of the environment, at the beginning of each cycle they were given a Semiannual Statistical Summary sheet, a Semiannual Bulletin, and certain supplemental messages.

The Semiannual Statistical Summary sheet indicated the status of the environment as of the starting date of the exercise and for each six-month period thereafter. The kinds of data given were: Gross National Product, U. S. federal budget, unemployment rate, ratio of nonwhite to white high school dropouts, etc. The Semiannual Bulletin gave participants information about policy support and opposition. It told them which policies had been adopted or were near adoption, and which had no support, some support, very strong support, no opposition, some opposition, etc.

Supplemental messages were used to provide additional details about the environment. For example, when the unemployment rate stood at 7.5 to 8.4 percent, Labor was sent the following message:

The president of the Brotherhood of Locomotive Firemen and Enginemen and the president of the International Brotherhood of Electrical Workers have issued a joint statement critical of the efforts of the national labor leadership in the struggle against unemployment.

A rate of 11.5 percent and above generated this message:

Reports of violence are being received from all parts of the country. Spontaneous demonstrations by unemployed workers are occurring in all major cities.

The entire decision-making process, as seen from the point of view of one interest group (Civil Rights), is shown in Figure 1.

### Socioeconomic model

A socioeconomic model of the environment was prepared to define the relationships between policies and national statistical indicators (e.g., Gross National Product and unemployment) through time. If none of the policies was adopted in any given cycle, then predetermined secular trends operated on the model. If, on the other hand, a policy was adopted, certain specific and related changes could be expected in the national indicators. The socioeconomic model was used to determine which variables would be affected and how. The general form of this model is shown in Table 2.

There is now general agreement that we

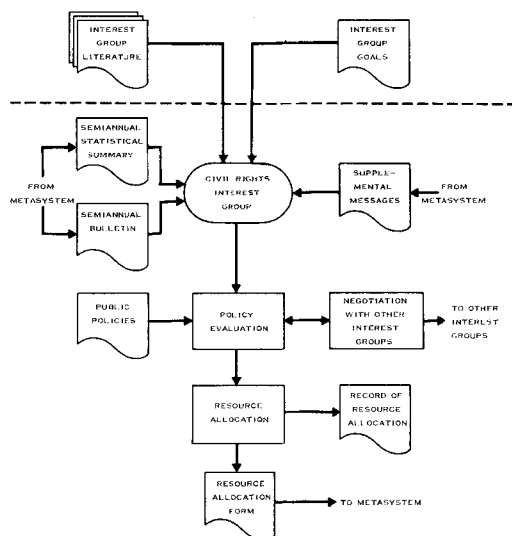


FIG. 1. An Interest Group (Civil Rights) Perspective of the Decision-Making Process.

live in a world where economic growth and technological change are causing major economic and social stresses. The model, therefore, as a description of the exercise environment, had to be dynamic; it had to reflect the constantly changing nature of the economy and society of the United States.

The "elements" of the model were socioeconomic indicators. The initial level of each of these elements was based on the latest available statistics, adjusted to bring them forward to the beginning of 1965. Continuing change in the level of the elements over time was achieved through the introduction of secular trends. These secular trends operated independently of any policy decisions taken by the participants and resulted in a change in the level of elements reported to participants at the beginning of each period. Thus it was assumed that built-in pressures would raise the level of the total U.S. federal budget by \$500 million per period, and that continuing efforts to keep children in school would result in a decrease of one percent per period in the number of high school dropouts.

Passage of any of the policies had measurable consequences for many of the elements. Thus a change in individual tax exemptions would change the Gross National Product,

TABLE 2  
THE SOCIO-ECONOMIC MODEL

ELEMENTS	POLICIES						
		1	2	3	4	5	6
GROSS NATIONAL PRODUCT INITIAL AMOUNT: 5425 BILLION	A	ADD 52.8 BILLION FOR 4 PERIODS	ADD 52.5 BILLION FOR 4 PERIODS	ADD 53.0 BILLION FOR 4 PERIODS	ADD BILLIONS PERIODS 1 3-7 1 3-10	ADD 52.0 BILLION FOR 4 PERIODS	
TOTAL U. S. FEDERAL BUDGET INITIAL AMOUNT: 500 BILLION	B			ADD 53.5 BILLION FOR 2 PERIODS		ADD 5750 MILLION FOR 4 PERIODS	
U. S. NATIONAL DEFENSE BUDGET INITIAL AMOUNT: 550 BILLION	C						
U. S. NONMILITARY BUDGET INITIAL AMOUNT: 550 BILLION	D			ADD 52.5 BILLION FOR 2 PERIODS		ADD 5750 MILLION FOR 4 PERIODS	
U. S. BUDGET FOR FOREIGN AID INITIAL AMOUNT: 13 BILLION	E						
PROFIT BEFORE TAXES INITIAL AMOUNT: 555 BILLION	F				SUBTRACT PERIODS BILLION 1-4 51 5-10 5.5		
BUSINESS EXPENDITURES FOR NEW PLANT AND EQUIPMENT INITIAL AMOUNT: 540 BILLION	G				ADD BILLIONS PERIODS 1 1-4 .5 5-10	IF INCREASE IN GNP IS: 2.70 & ABOVE . . . . 2.20 - 2.69 . . . . 1.70 - 2.19 . . . .	
PRODUCTIVITY INCREASE INITIAL AMOUNT: 3.5 %	H		ADD 1% FOR 10 PERIODS				
AVERAGE WEEKLY EARNINGS INDUSTRIAL WORKERS INITIAL AMOUNT: .85	I		ADD IF UNEMPLOYMENT RATE IS:		RATE OF INCREASE 2.75 % 2.25 % 1.75 %		
UNEMPLOYMENT RATE INITIAL AMOUNT: 5.8 %	J				SUBTRACT PERCENT PERIODS .5 1-4 .1 5-10		SUBTRACT ADD
HIGH SCHOOL DROPOUT RATE INITIAL AMOUNT: 35 %	K					SUBTRACT 2% FOR EACH PERIOD	
RATIO OF NON-WHITE TO WHITE UNEMPLOYED INITIAL AMOUNT: 2 TIMES	L			SUBTRACT .05 FOR 4 PERIODS			SUBTRACT .10 FOR 5 PERIODS
RATIO OF WHITE TO NON-WHITE PER CAPITA INCOME INITIAL AMOUNT: 2 TIMES	M			SUBTRACT .05 FOR 2 PERIODS			SUBTRACT .05 FOR 10 PERIODS
RATIO OF NON-WHITE TO WHITE HIGH SCHOOL DROPOUTS INITIAL AMOUNT: 2 TIMES	N					SUBTRACT .025 FOR EACH PERIOD	
PERCENTAGE OF NON-WHITE PERSONS OF VOTING AGE REGISTERED (IN 100 SOUTHERN COUNTIES) INITIAL AMOUNT: 8.5 %	O						
RATIO OF NON-WHITE TO WHITE PERSONS LIVING IN SUBSTANDARD HOUSING UNITS INITIAL AMOUNT: 3.5 TIMES	P			SUBTRACT .05 FOR EACH PERIOD			
MILITARY PERSONNEL AND CIVILIAN EMPLOYEES OF DEFENSE DEPART- MENT INITIAL AMOUNT: 4,100,000	Q						
U. S. MILITARY STRENGTH COMPARED TO U.S.S.R. INITIAL AMOUNT: EQUAL	R						
TOTAL U. S. BUDGET INITIAL AMOUNT: 5705 MILLION	S						

TABLE 2—continued

7		8		9		10		11		12		13		14	
THE FEDERAL GOVERNMENT SHOULD BE EMPLOYED TO PROTECT AND TO CONTROL THE INFLUENCE OF THE ARMY AND NAVY TO INFLUENCE THE GROUPS IS SOUND TO EXIST.		THE FEDERAL GOVERNMENT SHOULD BE EMPLOYED TO PROTECT AND TO CONTROL THE INFLUENCE OF THE ARMY AND NAVY TO INFLUENCE THE GROUPS IS SOUND TO EXIST.		THE FEDERAL GOVERNMENT SHOULD BE EMPLOYED TO PROTECT AND TO CONTROL THE INFLUENCE OF THE ARMY AND NAVY TO INFLUENCE THE GROUPS IS SOUND TO EXIST.		THE FEDERAL GOVERNMENT SHOULD BE EMPLOYED TO PROTECT AND TO CONTROL THE INFLUENCE OF THE ARMY AND NAVY TO INFLUENCE THE GROUPS IS SOUND TO EXIST.		THE U. S. SHOULD NEGOTIATE WITH THE SOVIET UNION TO ELIMINATE THE COMPLETE DISARMAMENT.		THE U. S. SHOULD ENLARGE ITS PRESENT CIVIL DEFENSE PROGRAM BY 500 MILLION PER YEAR.		AT A COST OF \$7 MILLION PER YEAR THE U. S. SHOULD ENLARGE ITS PRESENT CIVIL DEFENSE PROGRAM BY 500 MILLION PER YEAR.		THE U. S. SHOULD WITHDRAW FROM THE UNITED NATIONS.	
ADD \$7 BILLION FOR 4 PERIODS		ADD \$4.5 BILLION FOR 4 PERIODS		SUBTRACT PERIODS: 1-6 7-18 AMOUNT: 6.0 2.7		ADD \$1.2 BILLION FOR 1 PERIOD		ADD \$2 BILLION FOR 2 PERIODS		SUBTRACT \$0.2 BILLION PER PERIOD		ADD \$1.2 BILLION FOR 1 PERIOD		ADD \$1.2 BILLION FOR 1 PERIOD	
ADD \$2.75 BILLION FOR 4 PERIODS		ADD \$2 BILLION FOR 4 PERIODS		SUBTRACT PERIODS: 1-6 7-18 AMOUNT: 3.0 1.2		ADD \$0.3 BILLION FOR 1 PERIOD		ADD \$1 BILLION FOR 2 PERIODS		SUBTRACT \$0.1 BILLION PER PERIOD		ADD \$750 MILLION FOR 2 PERIODS		ADD \$750 MILLION FOR 2 PERIODS	
				SUBTRACT PERIODS: 1-6 7-18 AMOUNT: 2.6 1.2		ADD \$0.3 BILLION FOR 1 PERIOD		ADD \$1 BILLION FOR 2 PERIODS							
ADD \$2.75 BILLION FOR 4 PERIODS		ADD \$2 BILLION FOR 4 PERIODS						ADD \$1 BILLION FOR 2 PERIODS		SUBTRACT \$0.1 BILLION PER PERIOD		ADD \$750 MILLION FOR 2 PERIODS		ADD \$750 MILLION FOR 2 PERIODS	
IF INCREASE IN GNP IS: 2.3 & ABOVE ..... 10% 1.0 - 2.29 ..... 5% 0 - .99 ..... 0%		ADD \$7.5 BILLION FOR 4 PERIODS		IF GNP DECREASES: SUBTRACT 5%											
ADD PER YEAR ..... \$7.5 BILLION ..... 5.5 BILLION ..... 3.5 BILLION		1.00 - 1.59 ..... \$1.5 BILLION 0 - .99 ..... 0													
ADD IF UNEMPLOYMENT RATE IS: 6.5 - 7.4% ..... 7.5 & ABOVE ..... RATE OF INCREASE 1.25% 1%															
.1% FOR EACH .1% INCREASE IN GNP ABOVE 2.5% .1% FOR EACH .1% INCREASE IN GNP LESS THAN 2.5%.															
SUBTRACT .1% FOR 10 PERIODS		SUBTRACT 2% FOR EACH PERIOD													
		SUBTRACT 1 FOR 4 PERIODS													
SUBTRACT .025 FOR 10 PERIODS		SUBTRACT .025 FOR 10 PERIODS													
		ADD 10% FOR 5 PERIODS													
		SUBTRACT 1 FOR 10 PERIODS													
				SUBTRACT PERIODS: 1-6 7-12 13-20 AMOUNT: 150,000 130,000 195,000		ADD 25,000 PERSONS FOR 1 PERIOD									
				ADD 5% FOR EACH PERIOD								SUBTRACT \$0.1 BILLION PER PERIOD		ADD 5% FOR 2 PERIODS	

MODEL REVISIONS FOR LESS ARMED WORLD PHASE



TABLE 2—concluded

ELEMENTS	POLICIES	15	SECULAR TREND	
GROSS NATIONAL PRODUCT INITIAL AMOUNT: 5625 BILLION	A	ADD 52.0 BILLION FOR 4 PERIODS	ADD PERIODS PERCENT 1 & 2 2.25% THEREAFTER 1.75%	SUBTRACT PERIODS BILLIONS 1-6 6.0 7-18 2.7
TOTAL U. S. FEDERAL BUDGET INITIAL AMOUNT: 5100 BILLION	B	ADD 51 BILLION FOR 2 PERIODS	ADD -0.5 BILLION PER PERIOD	SUBTRACT PERIODS BILLIONS 1-6 2.6 7-18 1.2
U. S. NATIONAL DEFENSE BUDGET INITIAL AMOUNT 550 BILLION	C		SUBTRACT 500 MILLION PER PERIOD	SUBTRACT PERIODS BILLIONS 1-6 2.6 7-18 1.2
U. S. NONMILITARY BUDGET INITIAL AMOUNT: 450 BILLION	D	ADD 11 BILLION FOR 2 PERIODS	ADD 1 BILLION PER PERIOD	
U. S. BUDGET FOR FOREIGN AID INITIAL AMOUNT: 13 BILLION	E		RANDOM VARIATION IN EACH DIRECTION	
PROFIT BEFORE TAXES INITIAL AMOUNT: 555 BILLION	F			
BUSINESS EXPENDITURES FOR NEW PLANT AND EQUIPMENT INITIAL AMOUNT: 140 BILLION	G			
PRODUCTIVITY INCREASE INITIAL AMOUNT: 1.5%	H		ADD 1% PER PERIOD	
AVERAGE WEEKLY EARNINGS (INDUSTRIAL WORKERS) INITIAL AMOUNT: 1405	I			
UNEMPLOYMENT RATE INITIAL AMOUNT: 5.8%	J		NONE IF EMP. INCREASE > 2.5% PER PERIOD	
HIGH SCHOOL DROPOUT RATE INITIAL AMOUNT: 35%	K		INCREASE 1%	
RATIO OF NON WHITE TO WHITE UNEMPLOYED INITIAL AMOUNT: 2 TIMES	L		ADD 1 PER PERIOD	
RATIO OF WHITE TO NON WHITE PER CAPITA INCOME INITIAL AMOUNT: 2 TIMES	M		ADD 10 PER PERIOD	
RATIO OF NON WHITE TO WHITE HIGH SCHOOL DROPOUTS INITIAL AMOUNT: 2 TIMES	N		SUBTRACT 50 PER PERIOD	
PERCENTAGE OF NON WHITE PERSONS OF VOTING AGE REGISTERED (IN 100 SOUTHERN COUNTIES) INITIAL AMOUNT: 8.3%	O		ADD 1% PER PERIOD	
RATIO OF NON WHITE TO WHITE PERSONS LIVING IN SUBSTANDARD HOUSING UNITS INITIAL AMOUNT: 3.5 TIMES	P		NONE	
MILITARY PERSONNEL AND CIVILIAN EMPLOYEES OF DEFENSE DEPART- MENT INITIAL AMOUNT: 4,100,000	Q		SUBTRACT 27,000 PER PERIOD	SUBTRACT PERIODS NUMBER 1-6 150,000 7-13 130,000 14-20 190,000
U. S. MILITARY STRENGTH COMPARED TO U. S. S. R. INITIAL AMOUNT: EQUAL	R		EQUAL	
TOTAL U. N. BUDGET INITIAL AMOUNT: 5205 MILLION	S		ADD 1%	ADD 5% FOR EACH PERIOD

profits before taxes, business expenditures for new plant and equipment, average weekly earnings of industrial workers, and the unemployment rate, but would *not* change the total U.S. federal budget, etc.

Producing realistic estimates of the effects of certain policies on the elements occasionally presented difficulties. In some cases, the results of previously published and some unpublished studies were available. In other cases, the experimenters were forced to rely upon their own best judgment. Admittedly, the model was oversimplified. Most economic factors were directly keyed to the Gross National Product. Thus, for example, the unemployment rate was correlated solely with changes in the Gross National Product.

The model represented an initial effort to include quantifications of social and political pressures, as well as economic variables, within a single conceptual framework. It was assumed that continued growth in ability to produce would not be automatically balanced by increases in private demand and that the full utilization of men and machines would occur only with continued public stimulation of demand. Conditions leading to the possible development of inflation and economic depression were not incorporated in the model. It was felt that acute inflation or a severe slump would make it more difficult to study problems of national policy formation under conditions of disarmament.

Illustrative of the rationale used to derive the initial amounts and secular trends for each of the elements are the following:

1. Element A—"Gross National Product"

- a. Initial amount: \$625 billion
- b. Secular trend: Add 2.25 percent for periods 1 and 2

Add 1.75 percent thereafter

- c. Rationale: The Council of Economic Advisors estimated that the Gross National Product for calendar 1964 would fall in the \$618-628 billion range, assuming timely passage of the 1964 tax reduction bill. Since passage of the bill was in fact delayed, the Gross National Product figure for the beginning of 1965 was fixed at \$625 billion in the model.

The secular trend was based on the experience of the continuing economic upturn which began at the beginning of 1961.

With respect to the relationship of GNP and various policies, a multiplier of between 2.0 and 2.5 was assumed, the level varying with the probable secondary effect of increased expenditures. This meant that for every \$1 million of federal expenditures, there would be an increase in GNP of between \$2 million and \$2.5 million. An increase in the multiplier effect occurs if passage of a measure implies substantial commitments by other groups. For example, federal aid to education might well lead to large-scale state and local expenditures.

2. Element E—"U.S. Budget for Foreign Aid"

- a. Initial amount: \$3 billion per year
- b. Secular trend: None (To avoid unrealistic stability, random fluctuations of \$.1 billion were introduced.)
- c. Rationale: The foreign aid figure for fiscal 1964, rounded to the nearest billion, was used for the initial amount. With respect to the secular trend, major short-run forces were expected to exert pressure for a cut in the foreign aid budget. Counterbalancing this trend was pressure for an increase in foreign assistance to help provide full employment in the United States. It was assumed in the model that a stalemate would result, with no significant change in the level of aid expenditures.

3. Element L—"Ratio of Nonwhite to White Unemployed"

- a. Initial amount: 2 Times
- b. Secular trend: None
- c. Rationale: The rate of Negro unemployment has been disproportionately high in every year since 1955—more than twice the white average. The increasingly vigorous civil rights drive has been aimed at de-

veloping job opportunities for Negroes. However, in the immediate future, growing requirements for higher skill levels in jobs seem to be working to the Negroes' disadvantage. To allow for the uncertainty in estimating, the initial ratio of non-white to white unemployment for 1965 was set at 2 to 1. No secular trend factors were included in the model.

4. Element R—"U.S. Military Strength as Compared to the U.S.S.R."
  - a. Initial amount: Equal
  - b. Secular trend: None
  - c. Rationale: It was assumed that neither power would long tolerate a great disparity in strength vis-à-vis the other and that their respective military strengths would remain relatively equal, with no major shifts in the balance of power.

Since the pilot runs described in this paper were not computerized, it was necessary to make numerous simplifying assumptions about the relationship of policies to social and economic variables. Furthermore, the socioeconomic model, as it stands, reflects a biased view of the relationship of social and economic factors in American society. Because our objectives were to explore the possible uses of a simulation vehicle of this kind, details of the model are not crucial. It would be possible, in other words, to conduct future exercises, using the same basic model structure, but incorporating different assumptions about detailed effects.

All computations were made on a Friden calculator during the brief intervals between cycles, and the relative simplicity of the model was necessary to facilitate computation. Clearly, a digital computer would speed up calculations and allow far more complexity in the model. But for the purpose of developing hypotheses and testing feasibility, the present procedure was quite adequate and had the additional advantage of demonstrating that the simulation did not necessarily require elaborate computer capabilities.

### PILOT EXPERIMENT ONE

This was the first of two pilot experiments undertaken for the purpose of testing procedures, evaluating the experimental vehicle and facilities, and developing hypotheses and ideas. It was apparent to the experimenters that at least one run would be required to shake down the system and metasystem. The first pilot run was undertaken with this limited objective in mind.

All subjects for the first pilot experiment were recruited from the professional and administrative staff of a research and development corporation. The experiments were conducted in a large exercise room containing a circular table for each strategic interest group, a rectangular table for messengers and escorts, a clock, blackboards, and a speaker's lectern. A raised dais in an adjoining smaller room permitted the observation of activities in the large exercise room through one-way glass. This second room contained the Friden calculator, an electric typewriter, and audio systems for monitoring and taping participant behavior in all of the facilities.

At the start of the first day, participants met in the exercise room. There they received an orientation lecture describing the simulation vehicle in general terms, exercise aids, rules of operation, and the nature of each of the simulated interest groups. During this orientation period, participants also filled out a questionnaire designed to sample their attitudes on the various policies which were to be introduced during the simulation. They were assigned to interest groups and presented with the interest group materials and exercise forms. Participants were then advised that all future communications were to be in writing, except at formally arranged conferences; that messengers were available; that the date was 1 January 1965; and that they could allocate their resources for or against specific policies.

During each decision period, messages flowed freely among participants, and conferences were arranged in a separate room whenever requested. At the end of each period, resources were allocated individually and secretly by interest groups, and delivered via messenger to the metasystem.

The results were tabulated and the new data fed back to participants on a Semiannual Statistical Summary sheet. Participants also received a Semiannual Bulletin and supplementary messages. Following this feedback, a new cycle was begun. The simulation continued in this way for 9 cycles. After the exercise, a debriefing was held with participants in an effort to evaluate aids and improve simulation procedures.

### PILOT EXPERIMENT TWO

The purpose of the second experiment was to conduct and evaluate an improved simulation in a more controlled fashion with a second group of subjects. In addition, subjects were tested for the first time under two sets of very different conditions: Phase 1 of this experiment assumed a continuation of the arms race and Phase 2 assumed the conclusion of an agreement for arms control, allowing experimenters to generate hypotheses and ideas regarding the principal subject of inquiry, i.e., arms control.

Seven graduate students served as subjects. Six of these were political science majors. The seventh was a business administration major. The extra subject was recruited primarily for use as a replacement for any of the six required participants who might have been absent. The facilities were essentially the same as those described for Pilot Experiment One.

Several changes were introduced into the simulation vehicle for the second pilot experiment. Modifications were made in the socioeconomic model. For example, element "O" of the model, "Percentage of nonwhite persons of voting age registered (in 100 southern counties)," was not included in the second experiment. In order to compare policy formation in an armed and a less armed world, the experiment was conducted in two phases of five simulated years each. Phase 1, as indicated, assumed continuation of the arms race. Phase 2 assumed that a disarmament agreement had been signed and was in effect. Supplementary messages were introduced in Pilot Experiment Two for the first time.

### RESULTS AND CONCLUSIONS

These experiments should be considered as pilot rather than definitive studies. The

goal of a pilot study is to help insure that relevant hypotheses, variables, or ideas are not prematurely excluded from consideration. Our analysis of the results is, therefore, focused on generation of hypotheses and explication of ideas suggested by observations made during the preparation and conduct of the experiments—ideas and hypotheses which appear to merit more intensive examination. Some of these can be tested further with the experimental vehicle described. The examination of other hypotheses and ideas may require real-world analyses or experimental vehicles other than the one described.

### Negotiation behavior

As already indicated, participants in Experiment One were experienced administrators and scientists; participants in Experiment Two were graduate students. Figure 2 shows actions the participants took in support of or in opposition to policies available for their consideration at any given time. Observers noted some striking differences in negotiation methods between the two experiments. Thus, early in the course of the exercise, participants in the first experiment focused their efforts on a limited number of policies, whereas the less experienced participants of Experiment Two distributed their resources widely over a great many policies.

In general, negotiations by the less experienced participants produced fewer discernible consequences. A comparison of the first phase of Experiment Two with Experiment One indicates that the more experienced participants adopted five policies by the end of January 1968, whereas the less experienced participants had adopted none. Conference transcripts show that more experienced subjects focused their attention on fewer issues which they regarded as critical. It is, of course, possible that some variable other than experience, e.g., personality, may account for these observed differences, but the limited runs described here do not offer any additional clues regarding the source of the apparent difference.

### National policy formation

These experiments raise a series of questions about the mechanisms by which na-

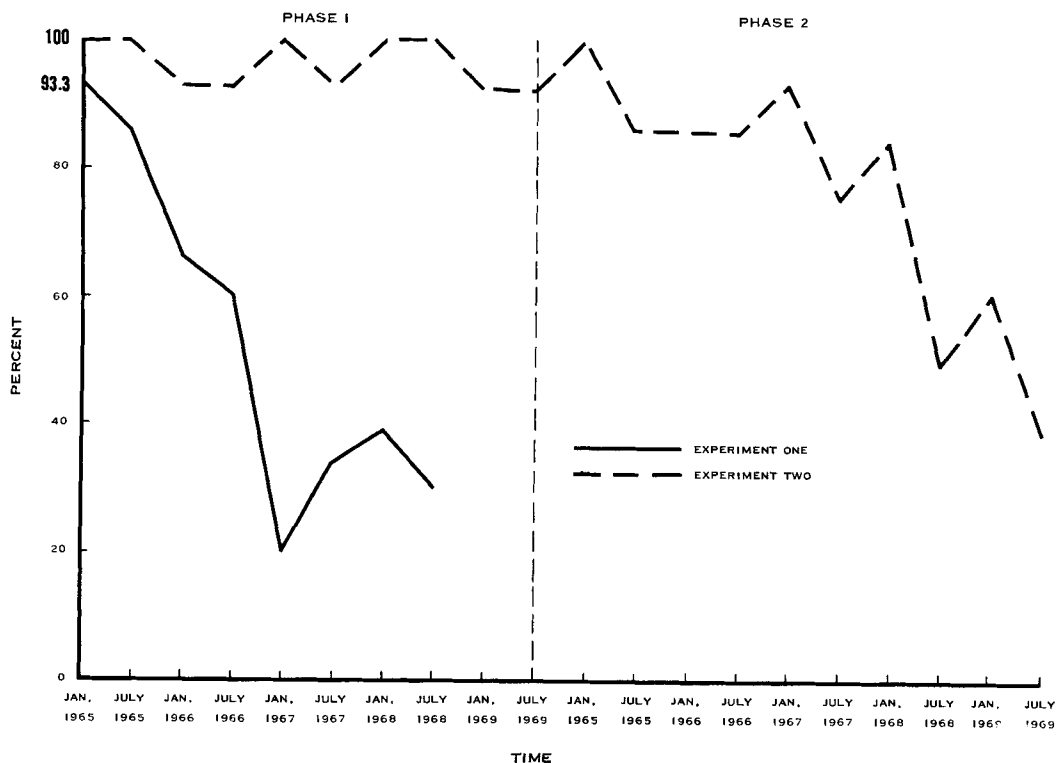


FIG. 2. Percent of Available Policies Supported or Opposed by One or More Groups. In Experiment One, participants experienced only Armed World; during Experiment Two, participants experienced both Armed World (Phase 1) and Less Armed World (Phase 2).

tional policies are formulated and adopted. It may be that for each strategic interest group there exists a unique profile of indicators which that group regards as relevant for describing the state of economic and social conditions. Do these indicators have limits of acceptability? For example, in the case of Labor, is the upper acceptable limit of unemployment rate indicator 8 percent or perhaps 10 percent? In our experiments, at least, when deviations in indicators exceeded certain limits and interest groups perceived policies as means for effecting changes in the indicators, attention was focused on specific policies, and what we call *issue crystallization* seemed to occur. Issue crystallization led to: (1) a search for policies to change the levels of the indicators; and (2) a search for allies to help support the desired policies. To what extent must policy formulation always be preceded by issue crystallization? What clues exist in the real world to show that the process of issue crystallization has begun?

How can the process be accelerated, retarded, or modified by effective formulation of national policies?

It is also interesting to speculate about the relationship, in both developed and developing countries, between the kinds of national statistics gathered and the kinds of policies formulated. The more advanced countries characteristically collect and disseminate a wide range of national statistical indicators. But even in these countries, history and tradition shape and rigidify the dimensions of data collection. To what extent is policy development in developing countries (as well as more advanced countries) affected by the special characteristics of their national indicators? Would the introduction of different indicators extend or reduce the range of possible policy choices? What is the effect of alternate indicators on national policy perspectives?

Examination of formal documents of strategic interest groups, and observations of

TABLE 3  
INTEREST GROUP SIMILARITIES IN  
RESOURCE ALLOCATIONS

Interest Groups	Similar Resource Allocations*		
	Experiment I	Experiment II	
		Armed World	Less Armed World
Business and Civil Rights	5	29	24
Business and Internationalists	4	25	29
Business and Labor	6	12	16
Business and Military	4	35	12
Business and Nationalists	2	31	8
Labor and Civil Rights	15	19	20
Labor and Internationalists	13	18	17
Labor and Military	6	24	8
Labor and Nationalists	1	16	9
Military and Internationalists	3	15	11
Military and Civil Rights	3	26	13
Military and Nationalists	6	54	22
Civil Rights and Internationalists	13	15	20
Civil Rights and Nationalists	1	23	8
Nationalists and Internationalists	1	13	11

\* The number of times various combinations of interest groups made similar resource allocations, i.e., the direction of support or opposition to a policy coincided.

behavior within the framework of the experimental vehicle, suggest that while interest groups differ widely in major goals, they may not differ much or at all on specific issues (Table 3). Additional experimentation may provide new insights into the technology of achieving national policy consensus.

### The impact of disarmament

As previously indicated, Experiment Two was divided into two phases of five simulated years each. The first phase is referred to as the armed world phase and the second as the less armed world phase. During the less armed world phase, participants were required to assume that the proposal for general and complete disarmament submitted by President Kennedy to the United Nations in 1961 was being implemented.

Table 4 shows how participants allocated their resources in each phase. Comparative allocations are indicated for all policies.

In the less armed world phase six policies were adopted, as compared to two in the armed world phase. Initial support in the

TABLE 4  
RESOURCE ALLOCATIONS IN THE ARMED AND LESS ARMED WORLD PHASES

Policy	Armed World Allocations		Less Armed World Allocations	
	For	Against	For	Against
1. Raise individual tax exemptions	63	18	0	3
2. Reduce corporate tax rate	114	124	95	31
3. Public works program	215	12	209+125*	2
4. Reduce work week	275	135	276	21
5. Federal aid to education	104	18	35	2
6. Eliminate employment discrimination	218	10	207	0
7. Aid to minority schools	211	2	223	0
8. Direct subsidies to eliminate poverty	15	32	47	2
9. Medical care	25	43	74	2
10A. General and complete disarmament	185	256		
10B. Abrogate disarmament agreement			400	100
10C. Reinstatement of disarmament			195	105
11. Civil defense	54	3	99	22
12A. Expand B-70 program	213	93		
12B. Anti-Communism campaign			36	28
13. Withdraw from United Nations	41	70	0	13
14. Increase foreign aid	125	152	248	69
15. Expand space program	172	2	216+115*	0
	2,030	970	2,600	400

\* These policies involved budget expenditures for limited time periods. The additional figures indicate resources allocated for readoption.

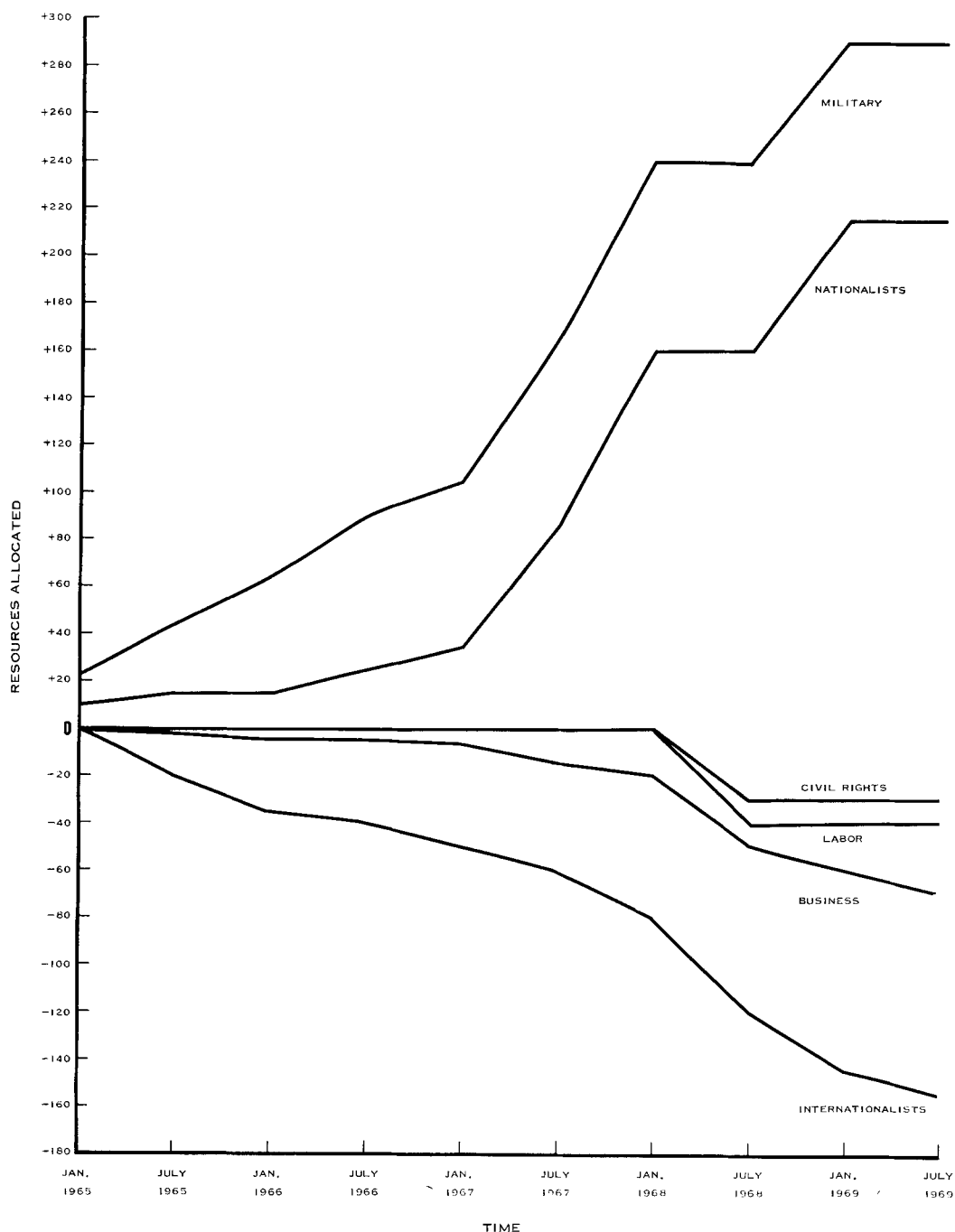


FIG. 3. Cumulative Resource Allocations For and Against Policy 10—Less Armed World Phase

less armed world phase crystallized around policy 15 (Table 2), adopted in January, 1966. Policy 4 was adopted in January, 1967, policy 3 in July, 1967, and policies 7

and 10 in January, 1968. The adoption of policy 10 (abrogation of the disarmament agreement) was accomplished by means of a coalition of the Nationalists and Military

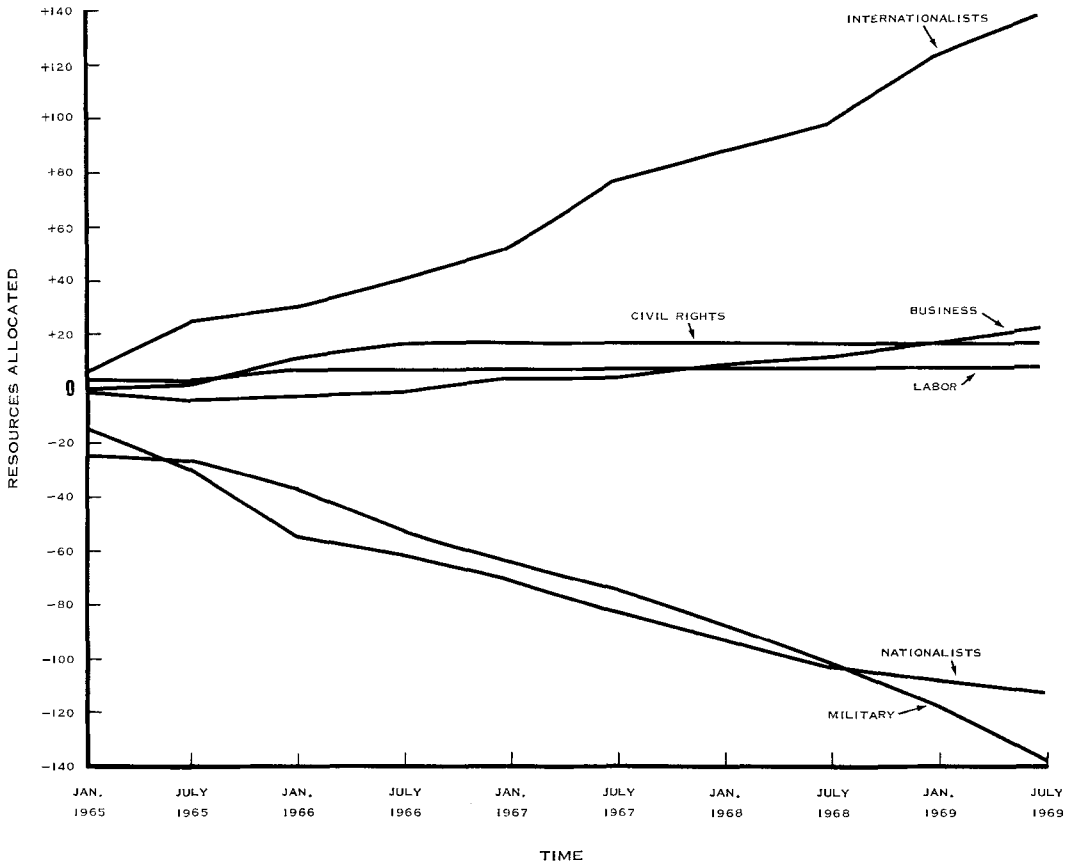


FIG. 4. Cumulative Resource Allocations For and Against Policy 10—Armed World Phase

groups (Figure 3). This, in turn, resulted in a broadly based countercoalition for reinstating the disarmament agreement.

One hypothesis suggested by the data is that under conditions of national crisis, such as rapidly rising unemployment in a less armed world, effective consensus will harden around a limited number of issues. But this consensus may be difficult to maintain in the absence of recurring crises.

Figure 4 summarizes the allocation of resources for and against policy 10 ("The U.S. should negotiate with the Soviets an agreement for complete disarmament") during the armed world phase. The Internationalist group was the only group supporting this proposal. Business, Civil Rights, and Labor groups either opposed or remained indifferent to it. During the less armed world phase, however, a strong coalition of Civil Rights, Labor, and Business emerged to counteract

the Military-Nationalist coalition which had forced the abrogation of the disarmament treaty.

Figure 5 compares unemployment rates in the two phases. Curves for the other indicators have not been plotted but tabular summaries of this material are available (Boguslaw, Davis, & Glick, 1964). Unemployment rose at an accelerated rate during the early years of the less armed world phase, but was declining by 1968. In January, 1969, another upward movement occurred, and unemployment resumed its climb at a sharply accelerated rate throughout the remainder of the experiment. This contrasts with the unemployment rate of the armed world phase which rose steadily throughout the experiment, although a somewhat diminished rate of increase was discernible beginning in July 1968. At the conclusion of the experiment in January, 1970, the unemployment rate was



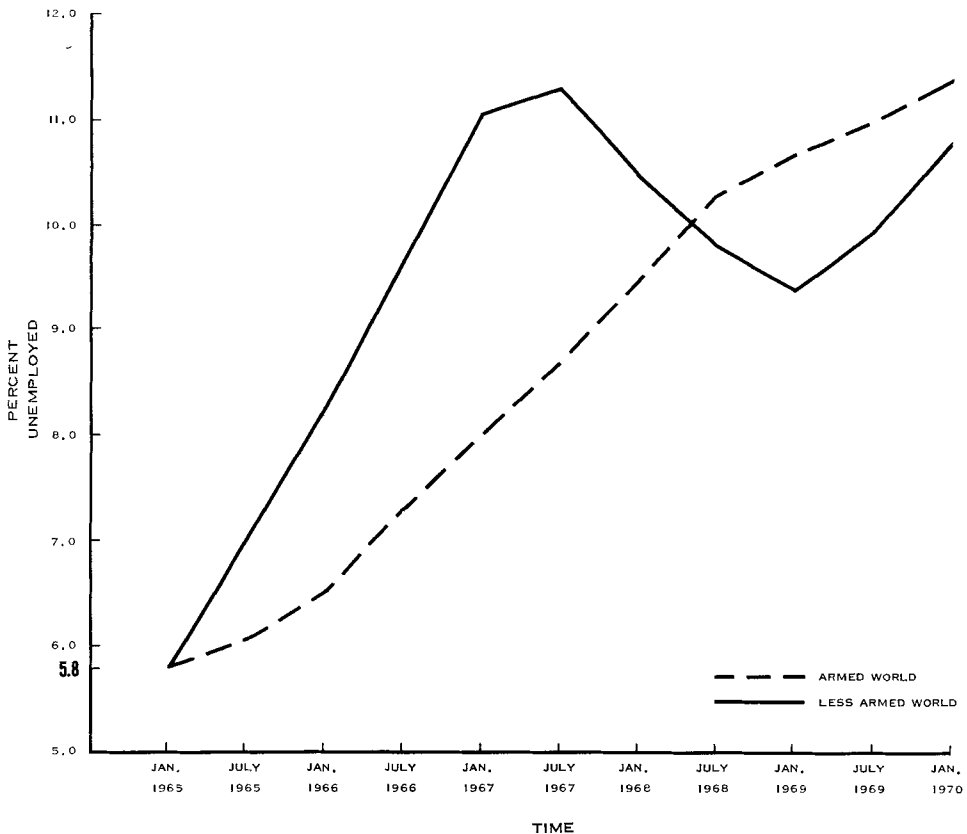


FIG. 5. Unemployment Rates in the Armed and Less Armed World Phases

11.3 percent as compared with 10.8 percent in the less armed world phase.

Figure 6 compares the military and the nonmilitary budgets for each phase. Although the nonmilitary budget kept rising during the less armed world phase, several years passed before increases in nonmilitary expenditures began to offset declines in military expenditures.

These initial experiments highlight the problem of achieving sufficient national consensus on nonmilitary activities to offset the social and economic consequences of a general and complete disarmament agreement. Clearly, better insights into the processes of policy formulation in a less armed world must await further experimentation. A specific problem in this regard concerns the social technology required during a period of declining military expenditures to insure gaining the necessary consensus of interest groups for the adoption of offsetting policies.

The question of validity is one that this

kind of experimentation inevitably raises. Specifically, the failure to use actual representatives of the strategic interest groups can be questioned, especially when attempts are made to apply the results to policy formulation in the real world. Participants in future experiments should, therefore, include leaders and/or representative members of various strategic interest groups. Such participation would clearly help increase the validity of these studies and provide additional insights for modifying the model.

A second observation can be made. The use of only one person to assume the role of an entire strategic interest group does not sufficiently take into account differences of opinion and alternate action recommendations existing *within* groups. It also fails to consider problems of achieving internal consensus.

A third point has to do with the choice of interest groups. Some interests have obviously been omitted from these experiments,

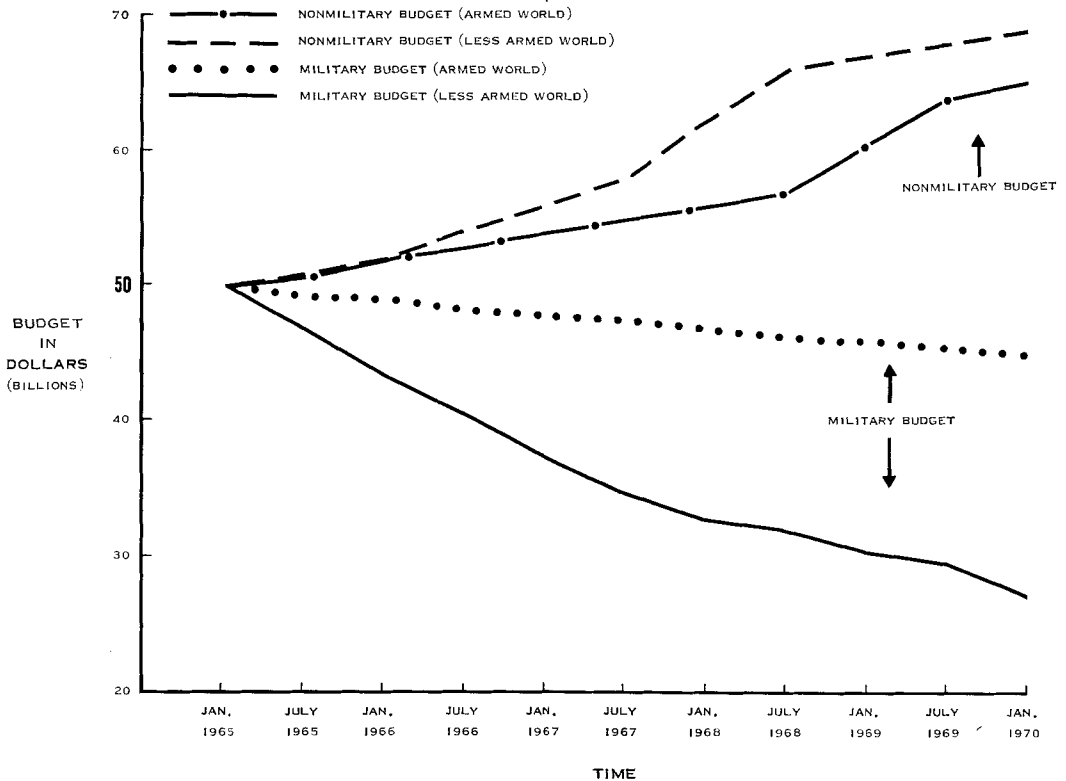


FIG. 6. Military and Nonmilitary Budgets in the Armed and Less Armed World Phases

e.g., religious, educational, scientific interests. However, inclusion of a complete range of interests is not necessary for many experimental purposes, e.g., negotiation-process research. And, indeed, the determination of precisely which interests are most decisive in shaping national policy formation remains a question for further empirical examination.

One critical parameter was the number of units required to adopt a policy. In this experiment, it was held constant at 200. This parameter appears to establish a climate for policy change. If the number required for passage is reduced, it is easier to effect change; if the number required is increased, it is more difficult. This parameter may well have measurable real life analogues. It may, in short, be possible to usefully characterize national climates as a function of consensual threshold levels required for adoption of new policies.

As has previously been observed, the socio-economic model used in these experiments

reflects some more or less well defined biases. They stem from theoretical assumptions about social and economic phenomena, and from the limitation of existing empirical data used to establish quantitative relationships among elements in the model. It is obviously possible to use alternate sets of assumptions and to include revised empirical data in subsequent experimental runs. Indeed, it has been suggested that a series of experiments might be conducted which would vary theoretical assumptions involved as basic independent variables.

Finally, it should be recalled that in these experiments the resources of all strategic interest groups remained equal in both the armed and the less armed world phases. This was true regardless of the extent to which the groups achieved their respective goals. In the world outside the experimental setting, however, resources available to strategic interest groups may well be proportionate to their respective achievements.

Specifically, it might be that the resources available to the Internationalists, for example, would be reduced in a less armed world as a function of their having achieved one of their important goals. Fewer resources would then be available to counter coalitions of the kind formed in our less armed world phase. This may well point to a peril confronting all voluntary associations and interest groups—as their policy objectives are fulfilled, organizations tend to become anachronisms in a changed world.

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When a man makes an ax, builds a house, hunts his prey, talks with his neighbor, plans for the future, makes a decision, loves his wife and child, or is aware of himself doing any of these things and myriad others, his *ego* is functioning. Lost to him is the unknowing world of other creatures whose adaptive behavior evolved as a fugue between the outer environment and the living organism. For having evolved consciousness, he stands alone at the pinnacle of the evolutionary hierarchy, dependent largely on his own self-directed action for survival. A whole new world of mental experience opens up before him, a world of infinite variety and limitless possibility for expansion. To harness it for his own survival needs, man evolved a way of organizing the multiplicity of experience into a productive thought or a useful action. *Ego* evolved as the integrating and synthesizing process in the mental life of man.

ESTHER AND WILLIAM MENAKER, *Ego in Evolution*